PATENT CLAIMS

1. Magnetic field sensor for the measurement of at least one component of a magnetic field, with a ring-shaped ferromagnetic core (4) attached to a semiconductor chip (1) that spans a plane with the at least one component of the magnetic field to be measured and that serves as magnetic field concentrator, and with a read-out sensor (5), whereby the read-out sensor (5) comprises at least one sensor that is integrated into the semiconductor chip (1) and arranged in the vicinity of the outer edge of the ferromagnetic core (4) and that measures the at least one component of the magnetic field, **characterised in that** the ferromagnetic core (4) is magnetized with a predetermined magnetization and that an excitation coil (3) and an electronic circuit (2) are present for the temporary application of a current to the excitation coil (3) to restore the predetermined magnetization in the ferromagnetic core (4).

2. Magnetic field sensor according to claim 1, **characterised in that** the ferromagnetic core (4) is circularly magnetized.

3. Magnetic field sensor according to claim 1 or 2, **characterised in that** the excitation coil (3) comprises at least one winding that encloses the ring of the ferromagnetic core (4).

4. Magnetic field sensor according to claim 1, **characterised in that** the ferromagnetic core (4) is radially magnetized.

5. Magnetic field sensor according to any of claims 1 to 4, **characterised in that** the excitation coil (3) comprises a flat coil the turns of which run spirally underneath the ferromagnetic core (4).

6. Magnetic field sensor according to any of claims 1 to 5, **characterised in that** the at least one sensor that forms the read-out sensor (5) is a Hall element (10).

7. Magnetic field sensor according to any of claims 1 to 6, **characterised in that** the read-out sensor (5) comprises two Hall elements (10, 12) that are arranged at diametrically opposite locations in relation to an axis of symmetry of the ferromagnetic core (4).

8. Magnetic field sensor according to any of claims 1 to 7, **characterised in that** the width of the ring of the ferromagnetic core (4) amounts to less than five percent of the diameter of the ferromagnetic core (4) and that the height of the ring of the ferromagnetic core (4) amounts to less than five percent of the diameter of the ferromagnetic core (4).

9. Method for operation of a magnetic field sensor for the measurement of at least one

component of a magnetic field, whereby the magnetic field sensor comprises a ring-shaped ferromagnetic core (4) attached to a semiconductor chip (1) that spans a plane with the at least one component of the magnetic field to be measured and that serves as magnetic field concentrator, and a read-out sensor (5), whereby the read-out sensor (5) comprises at least one sensor that is integrated into the semiconductor chip (1) and arranged in the vicinity of the outer edge of the ferromagnetic core (4) and measures the at least one component of the magnetic field, **characterised in that** the ferromagnetic core (4) is magnetized by temporary application of a current to an excitation coil (3) at specific times.

10. Method according to claim 9, **characterised in that** a direct current pulse is applied to the excitation coil (3) in order to magnetize the ferromagnetic core (4), whereby the maximum of the direct current pulse produces a magnetic field that is greater than the coercive field strength of the material of the ferromagnetic core (4).

11. Method according to claim 9, **characterised by** the following steps:

a) Applying a direct current pulse to the excitation coil (3), whereby the current flows through the excitation coil (3) in a first direction;
b) Reading out the output signal of the read-out sensor (5);
c) Applying a direct current pulse to the excitation coil (3), whereby the current flows through the excitation coil (3) in a direction opposite to the first direction;
d) Reading out the output signal of the read-out sensor (5);
e) Summing the signals of the read-out sensor (5) measured in steps b and d.